FINAL REPORT
FEBRUARY 2005

REPORT NO. 04-09

TRANSPORTABILITY TESTING OF THE FAMILY OF MEDIUM TACTICAL VEHICLES (FMTV) 2.5-TON AND 5-TON TRUCK AND TRAILER, TP-94-01, "TRANSPORTABILITY TESTING PROCEDURES"

Prepared for:

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Program Executive Office
Combat Support & Combat Service Support
Product Manager – Medium Tactical Vehicles
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DEPARTMENT OF THE ARMY
US ARMY DEFENSE AMMUNITION CENTER
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11 April 2005

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1. Enclosed please find subject report dated February 2005.

2. The POC is the undersigned, SJMAC-DEV, DSN 956-8908.

FOR THE DIRECTOR:

JERRY W. BEAVER
Chief, Validation Engineering Division

Encl
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REPORT NO. 04-09 **FEBRUARY 2005**

TRANSPORTABILITY TESTING OF THE FAMILY OF MEDIUM TACTICAL VEHILCES 2.5-TON AND 5-TON TRUCK AND TRAILER, TP-94-01, REV. 2, JUNE 2004 "TRANSPORTABILITY TESTING PROCEDURES"

ABSTRACT

The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV), was tasked by the Project Manager Medium Tactical Vehicles to conduct transportability testing on the Family of Medium Tactical Vehicles (FMTV) 2.5-Ton and 5-Ton Truck and Trailer. The 2.5-Ton and 5-Ton Truck and Trailer were manufactured by Stewart and Stevenson Services, Inc, Sealy, TX. The testing was conducted in accordance with TP-94-01, Revision 2, June 2004 "Transportability Testing Procedures."

The objective of the testing was to evaluate the FMTV 2.5-Ton and 5-Ton Truck and Trailer, when transportability tested in accordance with TP-94-01, Revision 2, June 2004.

The tie-down rings and anchors on the FMTV 2.5-Ton Truck and Trailer and the 5-Ton Truck and Trailer performed adequately during testing. The test loads utilized were effectively and efficiently secured utilizing the tie-down provisions as designed. The vehicles as currently designed, are adequate for the transport of bulk ammunition.

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VALIDATION ENGINEERING DIVISION
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REPORT NO. 04-09
TRANSPORTABILITY TESTING OF THE FAMILY OF MEDIUM TACTICAL VEHICLES (FMTV) 2.5-TON AND 5-TON TRUCK AND TRAILER, TP-94-01, REVISION 2, JUNE 2004 "TRANSPORTABILITY TESTING PROCEDURES"

TABLE OF CONTENTS

PART 1 – INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV), was tasked by the Project Manager Medium Tactical Vehicles to conduct transportability testing on the Family of Medium Tactical Vehicles (FMTV) 2.5-Ton and 5-Ton Truck and Trailer. The 2.5-Ton and 5-Ton Truck and Trailer were manufactured by Stewart and Stevenson Services, Inc, Sealy, TX. The testing was conducted in accordance with TP-94-01, Revision 2, June 2004 "Transportability Testing Procedures."

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Joint Munitions Command (JMC), Rock Island, IL. Reference is made to the following:

1. AR 740-1, 15 June 2001, Storage and Supply Activity Operation.

2. OSC-R, 10-23, Mission and Major Functions of U.S. Army Defense Ammunition Center (DAC) 21 Nov 2000.

C. OBJECTIVE. The objective of the testing was to evaluate the FMTV 2.5-Ton and 5-Ton Truck and Trailer, when transportability tested in accordance with TP-94-01, Revision 2, June 2004.

D. CONCLUSION. The tie-down rings and anchors on the FMTV 2.5-Ton Truck and Trailer and the 5-Ton Truck and Trailer performed adequately during testing. The test loads utilized were effectively and efficiently secured utilizing the tie-down provisions as designed. The vehicles as currently designed, are adequate for the transport of bulk ammunition.

PART 2 - ATTENDEES

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PART 3 - TEST EQUIPMENT

1. Truck, Cargo: LMTV, w/winch, M1078A1
   Manufactured by: Stewart and Stevenson Services, Inc., Sealy, TX
   Date of Manufacture: 1/2004
   VSN/USA: NH1NG4
   MFG. Serial Number: A-T100012BGAP
   Capacity: 2.5 tons
   Weight: 19,010 pounds

2. Trailer, Cargo, 2.5 Ton: LMTV; M1082
   Manufactured by: Stewart and Stevenson Services, Inc., Sealy, TX
   Date of Manufacture: 1/2004
   VSN/USA: PB05J7
   MFG. Serial Number: TL200001BGAP
   Capacity: 2.5 tons
   Weight: 7,004 pounds

3. Truck, Cargo: MTV, M1083A1
   Manufactured by: Stewart and Stevenson Services, Inc., Sealy, TX
   Date of Manufacture: 1/2004
   VSN/USA: NL1KWQ
   MFG. Serial Number: B-T100004BGMN
   Capacity: 5 tons
   Weight: 21,412 pounds

4. Trailer, Cargo, 5-Ton: MTV, M1095
   Manufactured by: Stewart and Stevenson Services, Inc., Sealy, TX
   Date of Manufacture: 1/2004
   VSN/USA: PB05PJ
   MFG. Serial Number: TM-200002BGAP
   Capacity: 5 tons
   Weight: 9,626 pounds

PART 4 - TEST PROCEDURES

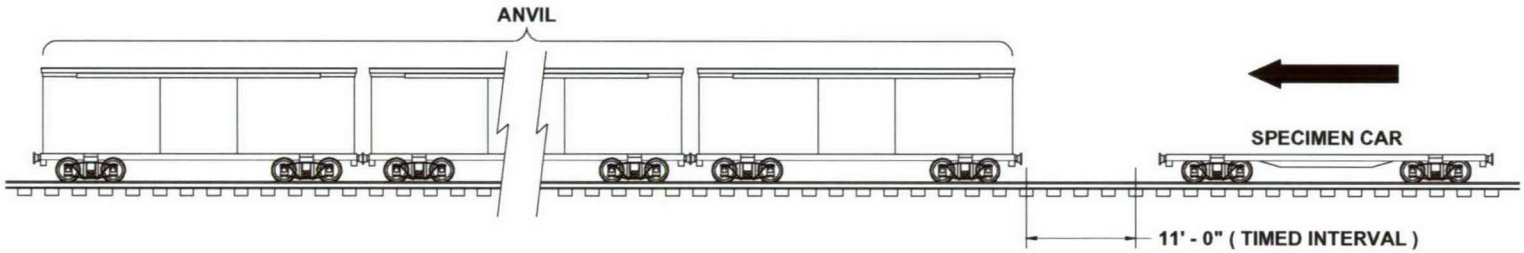
The test procedures outlined in this section were extracted from TP-94-01, "Transportability Testing Procedures," Revision 2, June 2004, for validating tactical vehicles and outloading procedures used for shipping munitions by tactical truck, railcar, and ocean-going vessel.

Inert (non-explosive) items were used to build the load. The test loads were prepared using the blocking and bracing procedures proposed for use with munitions (***see Part 6 for procedures***). The weight and physical characteristics (weights, physical dimensions, center of gravity, etc.) of the test loads were similar to live (explosive) ammunition. The following tests identified are normally required for transportability certification. However, not all tests will be required for some specific items.

A. RAIL TEST. RAIL IMPACT TEST METHOD. The test load or vehicle will be secured to a flatcar. The equipment needed to perform the test will include the specimen (hammer) car, four empty railroad cars connected together to serve as the anvil, and a railroad locomotive. The anvil cars will be positioned on a level section of track with air and hand brakes set and with draft gears compressed. The locomotive unit will push the specimen car toward the anvil at a predetermined speed, then disconnect from the specimen car approximately 50 yards away from the anvil cars allowing the specimen car to roll freely along the track until it strikes the anvil. This will constitute an impact. Impacting will be accomplished at speeds of 4, 6, and 8.1 mph in one direction and at a speed of 8.1 mph in the reverse direction. The tolerance for the speeds is plus 0.5 mph, minus 0.5 mph for the 4 mph and 6 mph impacts, and plus 0.5 mph, minus 0 mph for the 8.1 mph impacts. The impact speeds will be determined by using an electronic counter to measure the time for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars (see Figure 1).

ASSOCIATION OF AMERICAN RAILROADS (AAR)

STANDARD TEST PLAN



4 BUFFER CARS (ANVIL)
WITH DRAFT GEAR COMPRESSED AND AIR BRAKES IN A SET POSITION

ANVIL CAR TOTAL WT. 250,000 LBS (APPROX)

SPECIMEN CAR IS RELEASED BY SWITCH ENGINE TO ATTAIN: IMPACT NO. 1 @ 4 MPH
IMPACT NO. 2 @ 6 MPH
IMPACT NO. 3 @ 8.1 MPH

THEN THE CAR IS REVERSED AND RELEASED BY SWITCH ENGINE TO ATTAIN:

IMPACT NO. 4 @ 8.1 MPH

Figure 1. Rail Impact Sketch

B. ON/OFF ROAD TEST.

1. **HAZARD COURSE**. The test load or vehicle will be transported over the 200-foot-long segment of concrete-paved road consisting of two series of railroad ties projecting 6 inches above the level of the road surface. The hazard course will be traversed two times (see Figure 2).

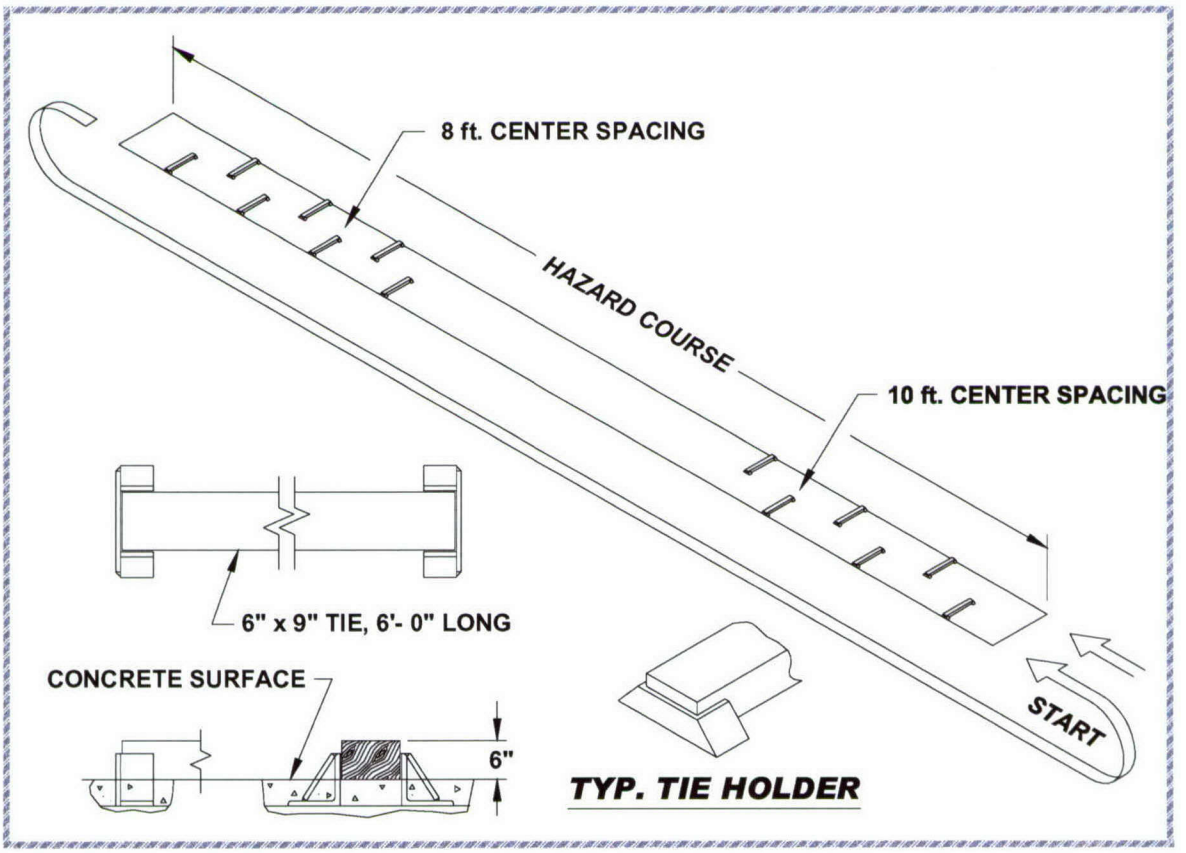


Figure 2. Hazard Course Sketch

a. The first series of 6 ties are spaced on 10-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.

b. Following the first series of ties, a paved roadway of 75 feet separates the first and second series of railroad ties.

c. The second series of 7 ties are spaced on 8-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 48 feet.

d. The test load is driven across the hazard course at speeds that will produce the most violent vertical and side-to-side rolling reaction obtainable in traversing the hazard course (approximately 5 mph).

2. ROAD TRIP. The test load or vehicle will be transported for a distance of 30 miles over a combination of roads surfaced with gravel, concrete, and asphalt. The test route will include curves, corners, railroad crossings and stops and starts. The test load or vehicle will travel at the maximum speed for the particular road being traversed, except as limited by legal restrictions.

3. PANIC STOPS. During the road trip, the test load or vehicle will be subjected to three (3) full airbrake stops while traveling in the forward direction and one in the reverse direction while traveling down a 7 percent grade. The first three stops are at 5, 10, and 15 mph while the stop in the reverse direction is approximately 5 mph. This testing will not be required if the Rail Impact Test is performed.

4. WASHBOARD COURSE. The test load or vehicle will be driven over the washboard course (see Figure 3) at a speed that produces the most violent response in the vertical direction.

C. OCEAN-GOING VESSEL TEST. 80-DEGREE TILT TEST. The test load (specimen) shall be positioned on level terrain with the bottom corner fittings resting on timbers so the entire container is supported solely by the bottom corner fittings. The timbers shall be oriented parallel to the end rails of the container and extend 2 feet beyond the corner fittings on each side. Using two mobile cranes and appropriate rigging, the container shall be rotated (tilted) using the bottom corner fittings on one side as a fulcrum. The rigging (slings) of one

crane shall be attached to the bottom corner fittings of the long side and the rigging (slings) of the second crane shall be attached to the top corner fittings on the opposite side. The tilting shall be accomplished by lifting the bottom corner fittings with the first crane so the container rotates about the opposite bottom corner fittings (fulcrum). Lifting/rotating by the first crane is continued until the center of gravity passes over the fulcrum, at which point the second crane shall provide support to the container and lower the container to the 80 degrees, plus or minus 2 degrees position. Rotation shall be accomplished smoothly at a slow speed so the container sidewall is subjected only to the static force of the interior load. The crane booms shall be adjusted to maintain a rear vertical suspension of the rigging at all times. In the case of end-opening type containers, at least one door (lower side of tilted container) must be closed and fastened throughout the test. The container shall be held in the tilted position for a minimum of two minutes. At which time, observations of both the container structure and the interior load shall be made. When the test is completed, the container shall be returned to its upright position using the same manner and care in handling.

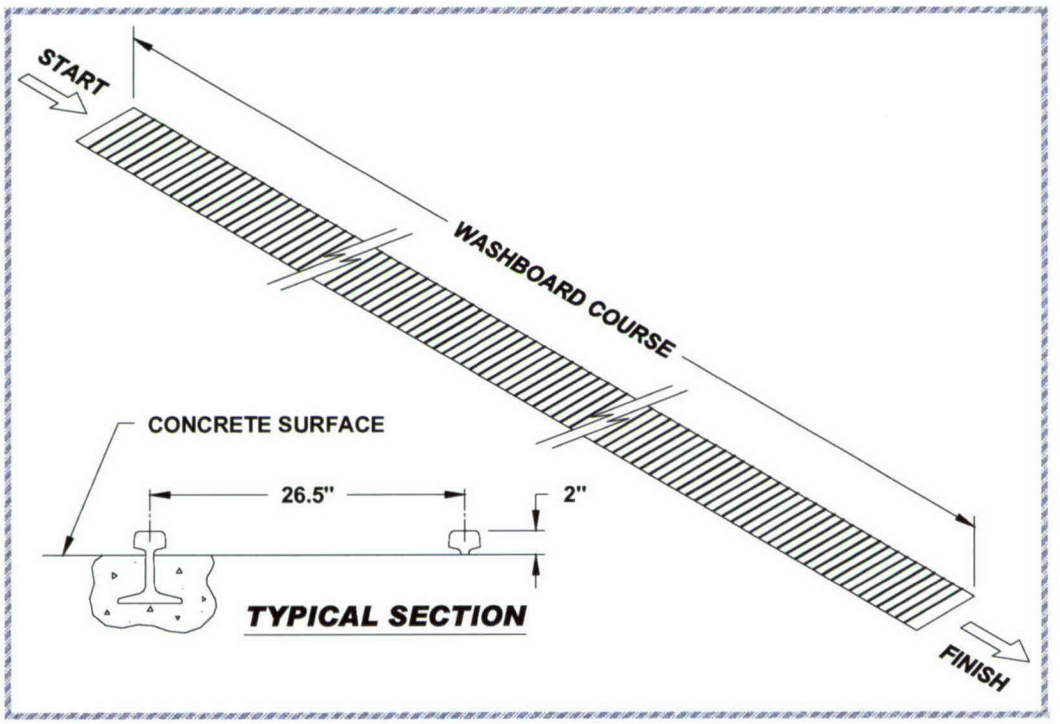


Figure 3. Washboard Course Sketch

PART 5 - TEST RESULTS

5.1

Testing Date: 19 January 2005

Test Specimen: 2.5-Ton Truck and Trailer

Payload: 120MM Tank Ammunition

Test Gross Weight: 35,580 pounds (including the 2.5-Ton Truck, 2.5-Ton Trailer and 120MM Tank Ammunition)

Payload Weight: 9,680 pounds (combined on the truck and the trailer)

A. RAIL TEST.

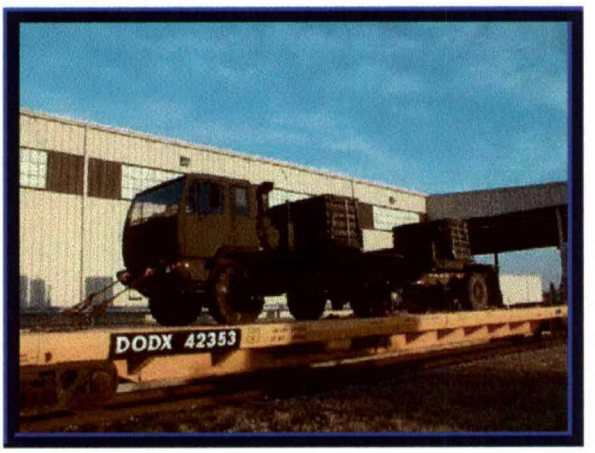


Photo 1. Rail Impact Testing of the FMTV 2.5-Ton Truck and Trailer with 120MM Tank Ammunition (Prior to Testing)

Description	Weight
Flatcar Number: DODX 42353	85,000 lbs.
FMTV 2.5-Ton Truck and Trailer	35,580 lbs.
Total Specimen Wt.	120,580 lbs.
Buffer Car (four cars)	257,900 lbs.

Figure 4.

Remarks: Figure 4 lists the test components and weights of the items used during the Rail Impact Tests.

Impact Number	Avg. Velocity (mph)
1	4.5
2	6.0
3	7.9
4	8.0
5	8.9

Figure 5.

Remarks:

1. The truck and trailer were secured to the flatcar IAW the Transportability Engineering Agency (TEA) Pamphlet 55-19, sixth edition, September 2003, "Tiedown Handbook for Rail Movements." The truck and trailer were each secured to the flatcar using four one-half-inch chains with a working load limit of 13,750 pounds.
2. Figure 5 lists the average speeds of the specimen car immediately prior to impact with the anvil.
3. Impacts #3 and #4 were each determined to be a "no test" due to the insufficient velocity at impact. The tests were repeated.
4. Following Impact #1 the payload moved 0.5 inches toward the passenger side and 1-inch in the direction of impact on the trailer. The payload on the truck moved 0-0.5 inches in the direction of impact.

5. Following Impact #2 the payload moved an additional 0.5 inches toward the passenger side and an additional 0.5 inches in the direction of impact on the trailer.

6. Following Impact #3 the payload moved 0.5 inches opposite the direction of impact on the truck and trailer.

7. Following Impact #4 the payload on the trailer moved 1.5 inches in the direction of impact. The base strap on the passenger side of the trailer was loose, but the load was still secure.

8. Following Impact #5 the base strap on the payload of the vehicle failed. The pallet moved 17.5 inches in the direction of impact. The payload on the trailer moved 0.5 inches in the direction of impact.

9. The testing was stopped due to the payload on the truck was not adequately restrained.

Photos 2. and 3. Securement of the FMTV 2.5-Ton Truck and Trailer to the Flatcar

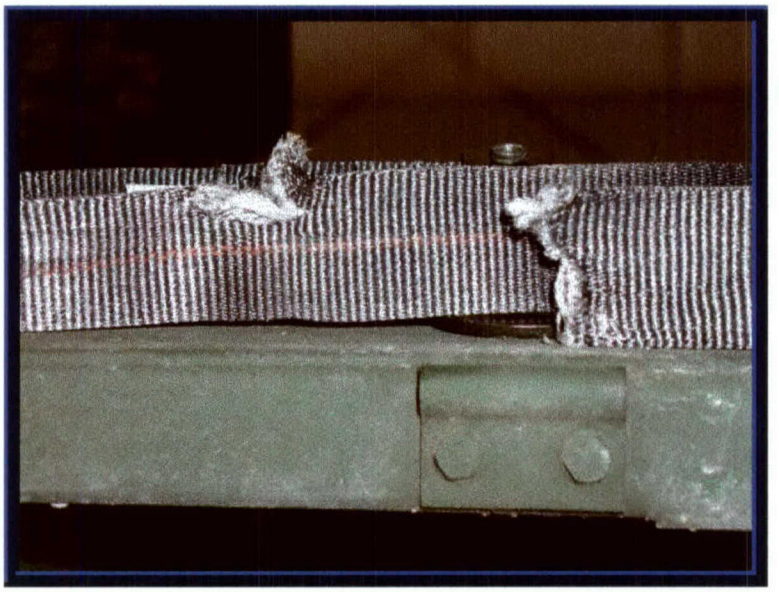


Photo 4. Damaged Strap

B. <u>CONCLUSION</u>:

1. Throughout testing the tie-down rings on the 2.5-Ton Truck and Trailer performed adequately. No damage occurred to the tie-down rings or anchors.

2. The single strap along the base of the 120MM Tank Ammunition Pallet caused damage to the pallet and the strap failed during testing.

3. The strapping configuration was changed from a single strap along the base to two straps across the top to secure the pallet. This strapping configuration tested successfully (see Part 5, page 5-14). See Part 6 for the load configuration.

5.2

Testing Date: 19-20 January 2005

Test Specimen: 5-Ton Truck and Trailer

Payload: 155MM Separate Loading Projectiles (SLP)

Test Gross Weight: 52,280 pounds (including the 5-Ton Truck, 5-Ton Trailer and 155MM SLP)

Payload Weight: 21,000 pounds (combined on the truck and trailer)

A. RAIL TEST.

Photo 5. Rail Impact Testing of the FMTV 5-Ton Truck and Trailer with 155MM Separate Loading Projectiles (Prior to Testing)

Description	Weight
Flatcar Number: DODX 42353	85,000 lbs.
FMTV 5-Ton Truck and Trailer	52,280 lbs.
Total Specimen Wt.	137,280 lbs.
Buffer Car (four cars)	257,900 lbs.

Figure 6.

Remarks: Figure 6 lists the test components and weights of the items used during the Rail Impact Tests.

Impact Number	Avg. Velocity (mph)
1	4.1
2	6.1
3	8.5
4	8.7

Figure 5.

Remarks:

1. The truck and trailer were secured to the flatcar IAW the Transportability Engineering Agency (TEA) Pamphlet 55-19, sixth edition, September 2003, "Tiedown Handbook for Rail Movements." The truck and trailer were each secured to the flatcar using four one-half-inch chains with a working load limit of 13,750 pounds.
2. Figure 5 lists the average speeds of the specimen car immediately prior to impact with the anvil. Impact #4 is the reverse impact.
3. Following Impact #1 the payload on the truck moved 0-0.25 inches in the direction of impact on the cab end.
4. Following Impact #2 the payload on the truck moved 0.25-0.5 inches in the direction of impact.
5. Following Impact #3 the payload on the truck moved 0.875-2.25 inches in the direction of impact. The payload on the trailer moved 0.25 inches in the direction of the impact.
6. Following Impact #4 the payload on the truck moved 1.875-3.25 inches in the direction of impact. The payload on the trailer moved 0.25-1.75 inches in the direction of impact.

Photos 6. and 7. Securement of the FMTV 5-Ton Truck and Trailer to the Flatcar.

B. ON/OFF ROAD TESTS.

1. HAZARD COURSE.

Photo 8. Hazard Course Testing of the FMTV 5-Ton Truck and Trailer with the 155MM Separate Loading Projectiles

Pass No.	Elapsed Time	Avg. Velocity (mph)
1	26 Seconds	5.4
2	25 Seconds	5.6

Figure 8.

Remarks:

1. Figure 8 lists the average speeds of the test load through the Hazard Course.

2. Inspection following Pass #2 revealed that the passenger side aft end cross strap on the truck was slipping. The payload remained safely in place.

Photo 9. Slipping Cross Strap at Aft End on the Truck

2. ROAD TRIP:

Remarks:

1. The Road Trip was conducted between the Road Hazard Course Passes #2 and #3.

2. Inspection following the completion of the Road Trip revealed that the cross strap at the aft end of the truck slid off of the payload. The payload remained safely in place.

Photo 10. Disengaged Cross Strap at Aft End on the Truck

3. **PANIC STOPS:** Testing was not required since the load was rail impact tested.

4. **HAZARD COURSE:**

Pass No.	Elapsed Time	Avg. Velocity (mph)
3	25 Seconds	5.6
4	26 Seconds	5.4

Figure 9.

Remarks:

1. Figure 9 lists the average speeds of the test load through the Hazard Course.
2. Inspection following Passes #3 and #4 revealed no additional movement of the payload.

5. **WASHBOARD COURSE:**

Remark: Inspection following the completion of the Washboard Course testing revealed no additional movement of the payload.

Photo 11. Washboard Course Testing of the FMTV 5-Ton Truck and Trailer with the 155MM Separate Loading Projectiles

D. <u>CONCLUSION</u>: Throughout testing the tie-down rings and anchors on the 5-Ton Truck and Trailer performed adequately. No damage occurred to the tie-down rings or anchors.

5.3

Testing Date: 24 January 2005

Test Specimen: 2.5-Ton Truck and Trailer

Payload: 120MM Tank Ammunition

Test Gross Weight: 35,660 pounds (including the 2.5-Ton Truck, 2.5-Ton Trailer and 120MM Tank Ammunition)

Payload Weight: 9,760 pounds (combined on the truck and the trailer)

A. <u>RAIL TEST.</u>

Photo 12. Rail Impact Testing of the FMTV 2.5-Ton Truck and Trailer with 120MM Tank Ammunition (Prior to Testing)

Description	Weight
Flatcar Number: DODX 42353	85,000 lbs.
FMTV 2.5-Ton Truck and Trailer	35,660 lbs.
Total Specimen Wt.	120,660 lbs.
Buffer Car (four cars)	257,900 lbs.

Figure 10.

Remarks: Figure 10 lists the test components and weights of the items used during the Rail Impact Tests.

Impact Number	Avg. Velocity (mph)
1	3.9
2	6.3
3	8.7
4	8.6

Figure 9.

Remarks:

1. The truck and trailer were secured to the flatcar IAW the Transportability Engineering Agency (TEA) Pamphlet 55-19, sixth edition, September 2003, "Tiedown Handbook for Rail Movements." The truck and trailer were each secured to the flatcar using four one-half-inch chains with a working load limit of 13,750 pounds.
2. Figure 9 lists the average speeds of the specimen car immediately prior to impact with the anvil.
3. Following Impact #1 the payload moved 1-inch in the direction of impact on the trailer. The payload on the truck moved 1.25 inches in the direction of impact.
4. Following Impact #2 the payload on the truck moved opposite the direction of impact 1.25 inches.

5. Following Impact #3 the payload moved 0.25 inches in the direction of impact on the trailer and there was fraying on the scuff sleeve of the forward base strap. The payload on the truck moved 0.75 inches in the direction of impact.

6. Following Impact #4 the base strap on the truck on the impact end failed and the payload moved 22.5 inches in the direction of impact. The strap also damaged the base of the pallet. The payload on the trailer moved 2.5 inches in the direction of impact.

Photo 13. Damage to the Pallet from the Strap

B. CONCLUSION:

1. Throughout testing the tie-down rings and anchors on the 2.5-Ton Truck and Trailer performed adequately. No damage occurred to the tie-down rings or anchors.

2. The single strap along the base of the 120MM Tank Ammunition Pallet caused damage to the pallet. The strap ultimately failed during testing.

3. The strapping configuration was changed from a single strap along the base to two straps across the top to secure the pallet. This strapping configuration tested successfully (see Part 5, page 5-14). See Part 6 for the load configuration.

5.4

Testing Date: 25 January 2005

Test Specimen: 2.5-Ton Truck and Trailer

Payload: 120MM Tank Ammunition

Test Gross Weight: 35,740 pounds (including the 2.5-Ton Truck, 2.5-Ton Trailer and 120MM Tank Ammunition)

Payload Weight: 9,840 pounds (combined on the truck and the trailer)

A. <u>RAIL TEST.</u>

Photo 14. Rail Impact Testing of the FMTV 2.5-Ton Truck and Trailer with 120MM Tank Ammunition (Prior to Testing)

Description	Weight
Flatcar Number: DODX 42353	85,000 lbs.
FMTV 2.5-Ton Truck and Trailer	35,740 lbs.
Total Specimen Wt.	120,740 lbs.
Buffer Car (four cars)	257,900 lbs.

Figure 12.

Remarks: Figure 12 lists the test components and weights of the items used during the Rail Impact Tests.

Impact Number	Avg. Velocity (mph)
1	4.3
2	6.2
3	9.1
4	8.7

Figure 13.

Remarks:

1. The truck and trailer were secured to the flatcar IAW the Transportability Engineering Agency (TEA) Pamphlet 55-19, sixth edition, September 2003, "Tiedown Handbook for Rail Movements." The truck and trailer were each secured to the flatcar using four one-half-inch chains with a working load limit of 13,750 pounds.
2. Figure 13 lists the average speeds of the specimen car immediately prior to impact with the anvil.
3. Following Impact #1 the payload on the truck moved 2.25 inches in the direction of impact.
4. Following Impact #2 the payload on the trailer moved in the direction of impact 0.25 inches.

5. Following Impact #3 the payload moved 1.0-1.5 inches in the direction of impact on the trailer. The payload on the truck moved 1.5 inches in the direction of impact.

6. Following Impact #4 the payload on the trailer moved 1.75 inches in the direction of impact. The payload on the truck moved 3.25 inches in the direction of impact.

B. ON/OFF ROAD TESTS.

1. HAZARD COURSE.

Photo 15. Hazard Course Testing of the FMTV 2.5 –Ton Truck and 2.5-Ton Trailer with 120MM Tank Ammunition

Pass No.	Elapsed Time	Avg. Velocity (mph)
1	25 Seconds	5.6
2	25 Seconds	5.6

Figure 14.

Remarks:

1. Figure 14 lists the average speeds of the test load through the Hazard Course.
2. Inspection following the completion of Pass #1 revealed that the payload on the truck moved 1.25 inches toward the passenger side.
3. Inspection following the completion of Pass #2 revealed that the payload on the truck moved an additional 1-inch toward the passenger side.

2. ROAD TRIP:

Remarks:

1. The Road Trip was conducted between the Road Hazard Course Passes #2 and #3.
2. Inspection following the completion of the road trip revealed that the payload on the truck had moved 0.25 inches toward the driver's side.

3. PANIC STOPS: Testing was not required since the load was rail impact tested.

4. HAZARD COURSE:

Pass No.	Elapsed Time	Avg. Velocity (mph)
3	25 Seconds	5.6
4	24 Seconds	5.9

Figure 15.

Remarks:

1. Figure 15 lists the average speeds of the test load through the Hazard Course.
2. Inspection following Pass #3 revealed the payload on the truck moved toward the passenger side 0.25 inches.

5. WASHBOARD COURSE:

Remark: Inspection following the completion of the Washboard Course testing revealed no additional movement of the payload.

Photo 16. Washboard Course Testing of the FMTV 2.5-Ton Truck and Trailer with 120MM Tank Ammunition

C. CONCLUSION: Throughout testing the tie-down rings and anchors on the 2.5- Ton Truck and Trailer performed adequately. No damage occurred to the tie-down rings or anchors.

5.5

Testing Date: 27 January 2005

Test Specimen: 5-Ton Truck and Trailer

Payload: 120MM Tank Ammunition

Test Gross Weight: 51,200 pounds (including the 5-Ton Truck, 5-Ton Trailer and 120MM Tank Ammunition)

Payload Weight: 19,920 pounds (combined on the truck and the trailer)

A. ON ROAD TESTS.

1. HAZARD COURSE.

Photo 17. Hazard Course Testing of the FMTV 5–Ton Truck and Trailer with 120MM Tank Ammunition

Pass No.	Elapsed Time	Avg. Velocity (mph)
1	23 Seconds	6.1
2	23 Seconds	6.1

Figure 16.

Remarks:

1. Figure 16 lists the average speeds of the test load through the Hazard Course.
2. Inspection following the completion of Pass #1 revealed that the payload on the truck moved forward 0.5 inches.

2. ROAD TRIP:

Remarks:

1. The Road Trip was conducted between the Road Hazard Course Passes #2 and #3.
2. Inspection following the completion of the road trip revealed that there was no additional movement of the payload.

3. PANIC STOPS:

Remarks:

1. The Panic Stops were conducted during the Road Trip.
2. Inspection following the completion of the Panic Stops revealed no additional movement of the payload.

4. HAZARD COURSE:

Pass No.	Elapsed Time	Avg. Velocity (mph)
3	26 Seconds	5.4
4	26 Seconds	5.4

Figure 17.

Remarks:

1. Figure 17 lists the average speeds of the test load through the Hazard Course.
2. Inspection following the completion of the Hazard course revealed no additional movement of the payload.

5. WASHBOARD COURSE:

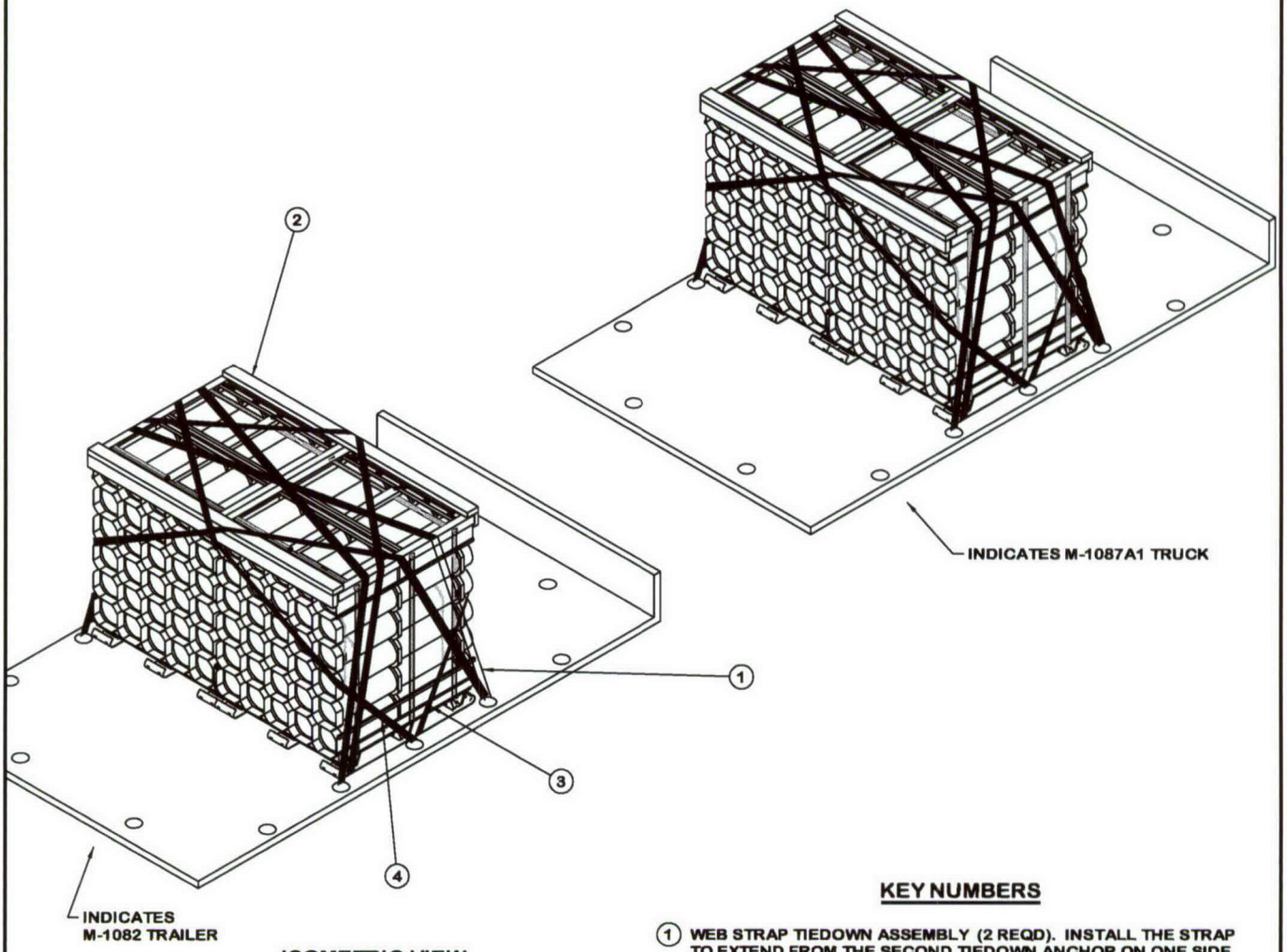
Remark: Inspection following the completion of the Washboard Course testing revealed no additional movement of the payload.

Photo 18. Washboard Course Testing of the FMTV 5-Ton Truck and 5-Ton Trailer with 120MM Tank Ammunition

C. CONCLUSION: Throughout testing the tie-down rings and anchors on the 5-Ton Truck and Trailer performed adequately. No damage occurred to the tie-down rings or anchors.

PART 6– DRAWINGS

The following test sketches represent the load configurations that were subjected to the test criteria.



ISOMETRIC VIEW

NOTE: THE QUANTITY OF WEB STRAP TIEDOWN ASSEMBLIES SHOWN IN KEY NUMBERS IS FOR ONE MODE OF CONVEYANCE ONLY. DOUBLE THE QUANTITY OF STRAPS TO LOAD BOTH THE TRUCK AND THE TRAILER.

KEY NUMBERS

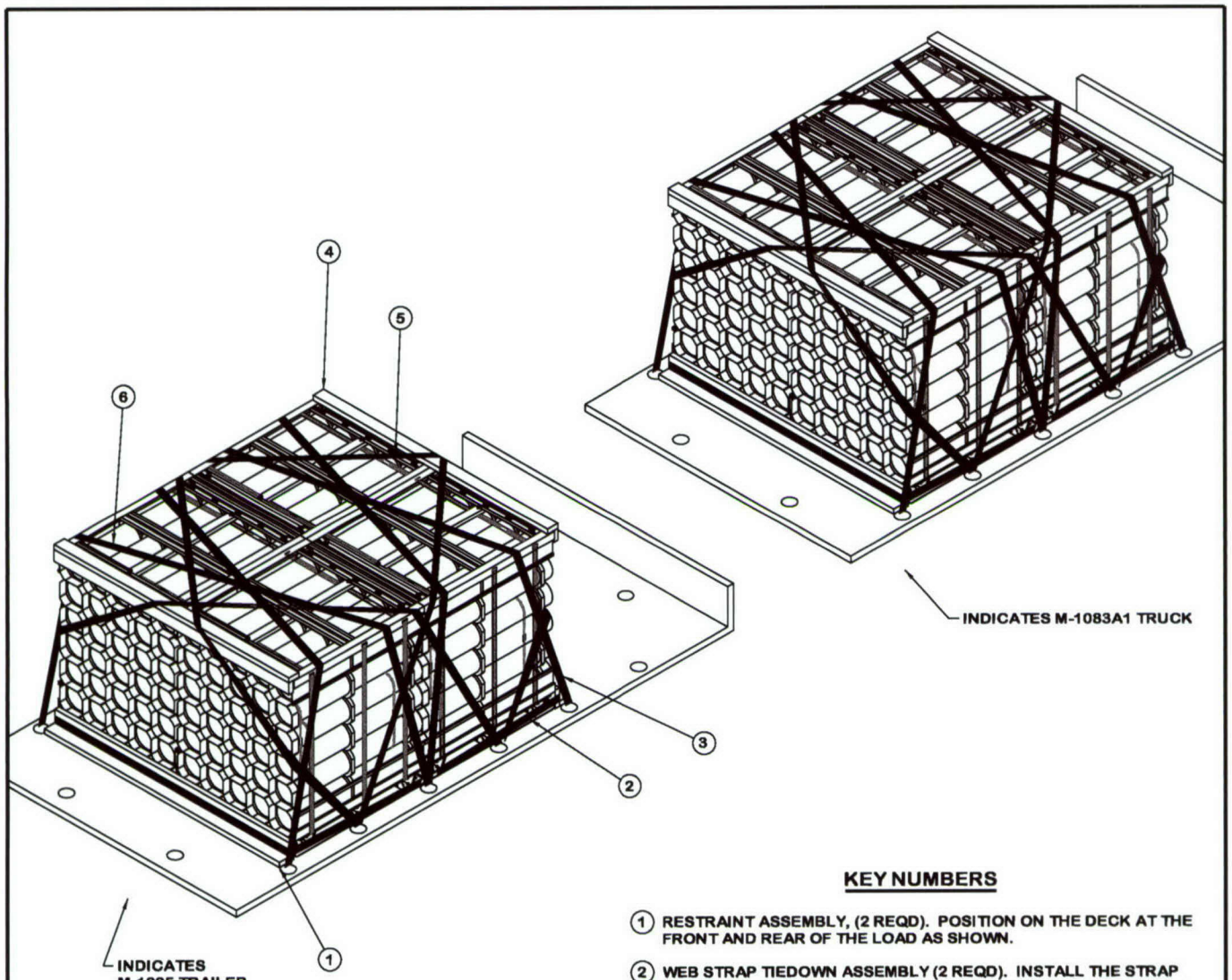
(1) WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL THE STRAP TO EXTEND FROM THE SECOND TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, OVER THE PALLET UNITS AS SHOWN TO THE FOURTH TIEDOWN ANCHOR ON THE OPPOSITE SIDE OF THE DECK. NOTE: EACH SET OF PALLETS ACROSS THE DECK WIDTH SHALL HAVE A MINIMUM OF TWO STRAPS.

(2) EDGE PROTECTOR ASSEMBLY, (2 REQD). POSITION AT THE FRONT AND REAR OF THE LOAD AS SHOWN.

(3) WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL THE STRAP TO EXTEND FROM THE THIRD TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, OVER THE FRONT OF THE PALLET UNITS AND EDGE PROTECTOR ASSEMBLY AS SHOWN TO THE FOURTH TIEDOWN ANCHOR ON THE OPPOSITE SIDE OF THE DECK.

(4) WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL THE STRAP TO EXTEND FROM THE SECOND TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, OVER THE REAR OF THE PALLET UNITS AND EDGE PROTECTOR ASSEMBLY AS SHOWN TO THE THIRD TIEDOWN ANCHOR ON THE OPPOSITE SIDE OF THE DECK.

120MM LOAD ON M-1078A1 TRUCK AND M-1082 TRAILER



NOTE: THE QUANTITY OF WEB STRAP TIEDOWN ASSEMBLIES SHOWN IN KEY NUMBERS IS FOR ONE MODE OF CONVEYANCE ONLY. DOUBLE THE QUANTITY OF STRAPS TO LOAD BOTH THE TRUCK AND THE TRAILER.

KEY NUMBERS

(1) RESTRAINT ASSEMBLY, (2 REQD). POSITION ON THE DECK AT THE FRONT AND REAR OF THE LOAD AS SHOWN.

(2) WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL THE STRAP TO EXTEND FROM THE THIRD TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, AROUND THE RESTRAINT ASSEMBLY TO THE THIRD TIEDOWN ANCHOR ON THE OPPOSITE SIDE OF THE DECK AS SHOWN.

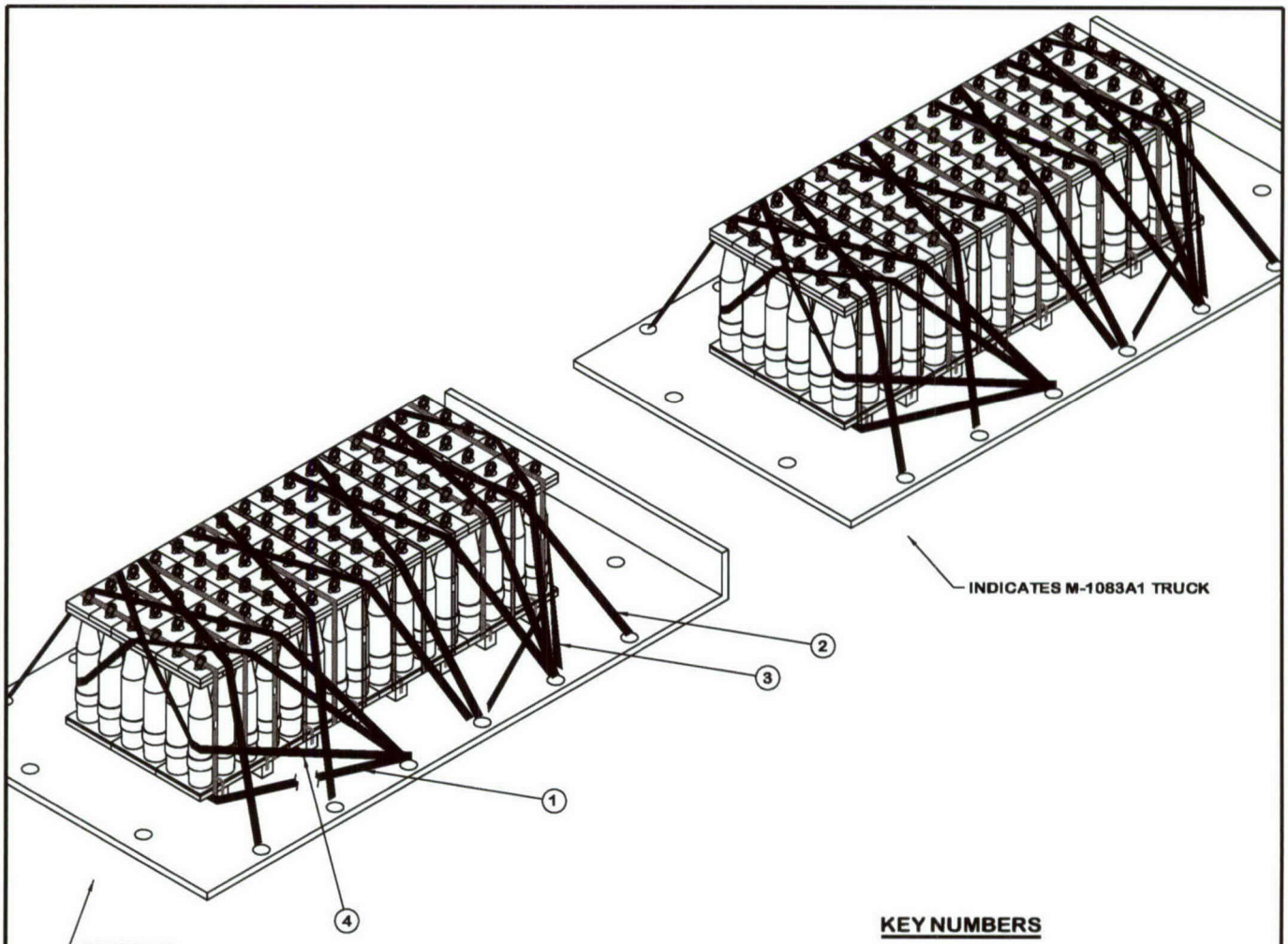
(3) WEB STRAP TIEDOWN ASSEMBLY (8 REQD). INSTALL THE STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, OVER THE PALLET UNITS TO A TIEDOWN ANCHOR ON THE OPPOSITE SIDE OF THE DECK. **NOTE:** EACH SET OF PALLETS ACROSS THE DECK WIDTH SHALL HAVE A MINIMUM OF TWO STRAPS.

(4) TOP EDGE PROTECTION ASSEMBLY, (2 REQD). POSITION ON TOP OF THE PALLET UNITS AT THE FRONT AND REAR OF THE LOAD AS SHOWN.

(5) WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL THE STRAP TO EXTEND FROM THE SECOND TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, AROUND THE FRONT OF A FORWARD PALLET UNIT, OVER THE FORWARD EDGE PROTECTOR AND DOWN TO THE FIFTH TIEDOWN ANCHOR ON THE OPPOSITE SIDE OF THE DECK AS SHOWN.

(6) WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL THE STRAP TO EXTEND FROM THE THIRD TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, OVER THE PALLET UNIT AND THE REAR EDGE PROTECTOR AND ACROSS THE BACK OF A REAR PALLET UNIT TO THE FIFTH TIEDOWN ANCHOR ON THE OPPOSITE SIDE OF THE DECK AS SHOWN.

120MM LOAD ON M-1083A1 TRUCK AND M-1095 TRAILER



ISOMETRIC VIEW

NOTE: THE QUANTITY OF WEB STRAP TIEDOWN ASSEMBLIES SHOWN IN KEY NUMBERS IS FOR ONE MODE OF CONVEYANCE ONLY. DOUBLE THE QUANTITY OF STRAPS TO LOAD BOTH THE TRUCK AND THE TRAILER.

KEY NUMBERS

(1) WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL THE STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, AROUND THE PALLET UNIT SKID AS SHOWN TO THE CORRESPONDING TIEDOWN ANCHOR ON THE OTHER SIDE OF THE DECK.

(2) WEB STRAP TIEDOWN ASSEMBLY (8 REQD). INSTALL THE STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, OVER THE PALLET UNITS AS SHOWN TO A TIEDOWN ANCHOR ON THE OTHER SIDE OF THE DECK. NOTE: EACH SET OF PALLETS ACROSS THE DECK WIDTH SHALL HAVE A MINIMUM OF TWO STRAPS.

(3) WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL THE STRAP TO EXTEND FROM THE SECOND TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, AROUND THE FRONT OF THE PALLET UNIT AND OVER THE TOP AS SHOWN TO THE SECOND TIEDOWN ANCHOR ON THE OPPOSITE SIDE OF THE DECK.

(4) WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL THE STRAP TO EXTEND FROM THE FOURTH TIEDOWN ANCHOR ON ONE SIDE OF THE DECK, AROUND THE REAR PALLET UNIT AND OVER THE TOP AS SHOWN TO THE FOURTH TIEDOWN ANCHOR ON THE OTHER SIDE OF THE DECK.

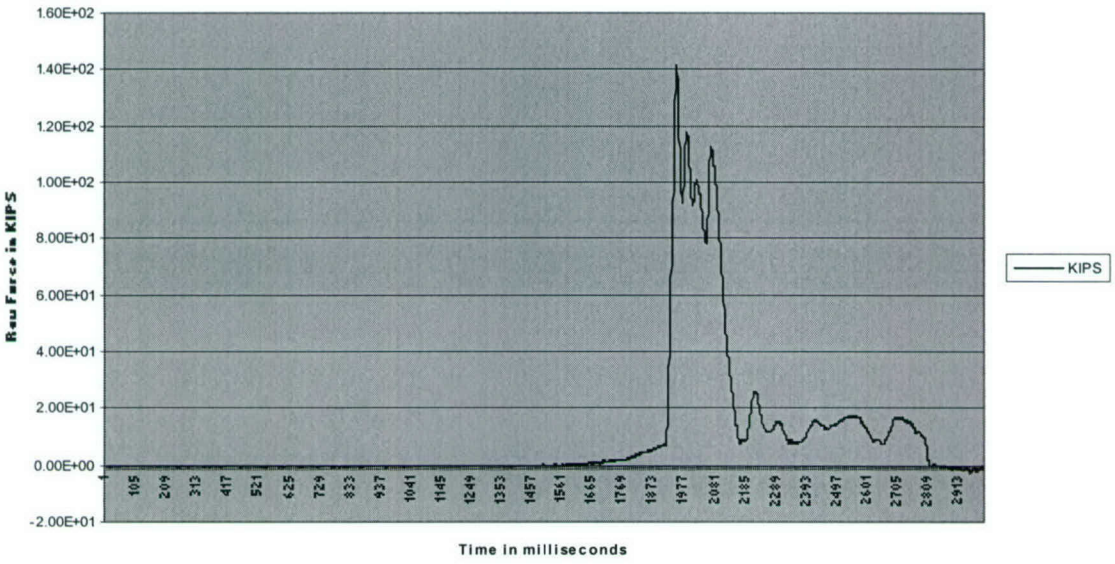
155MM LOAD ON M-1083A1 TRUCK AND M-1095 TRAILER

PART 7- COUPLER DATA

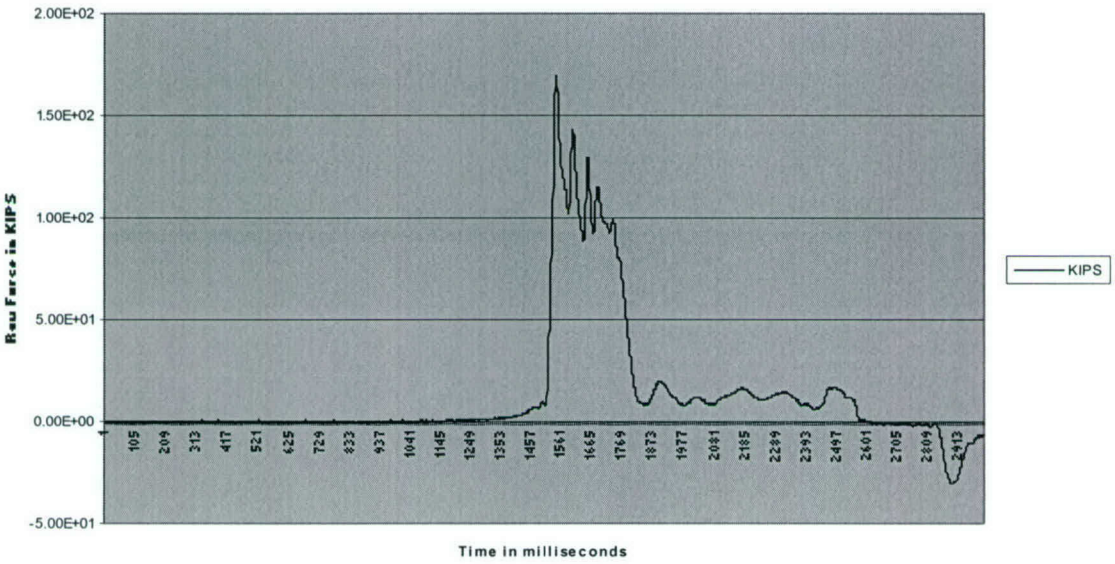
The following graphs depict the force on the anvil coupler.

A. FMTV 2.5-Ton Truck:
Date: 19 January 2005

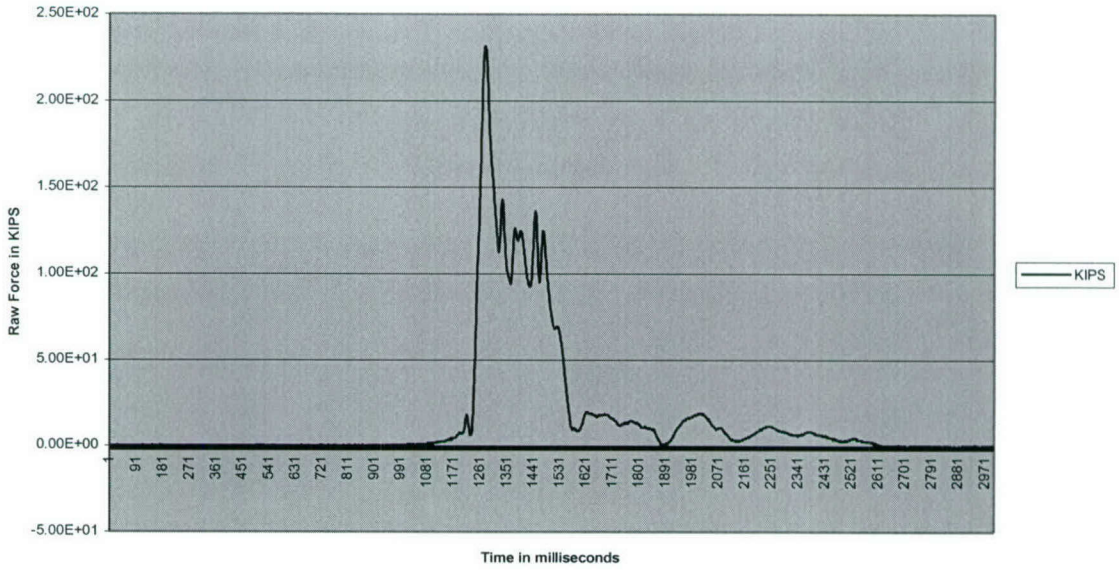
Coupler 4.48 Mph



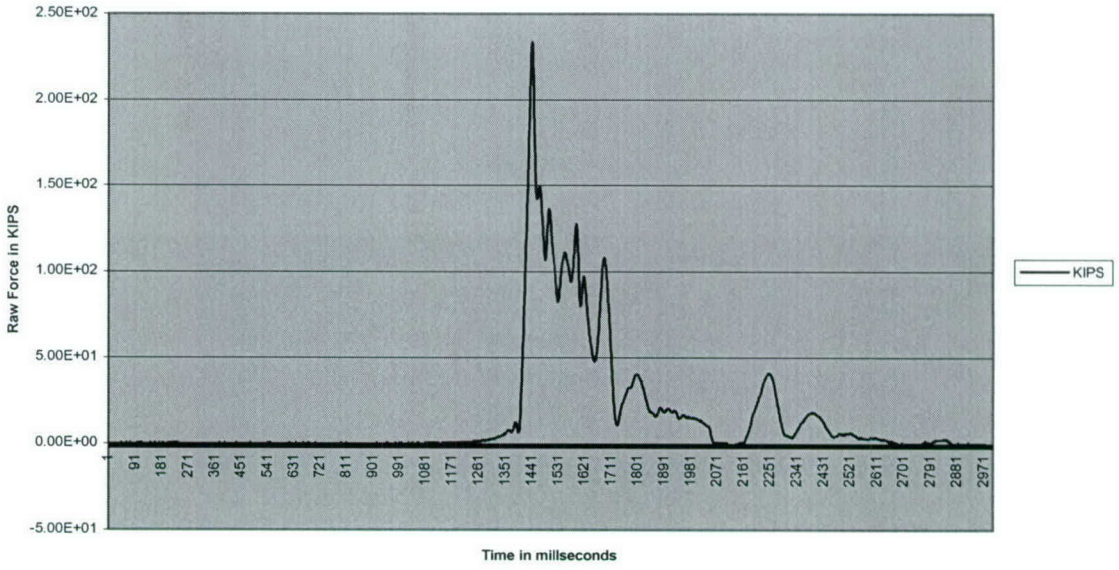
Coupler 6.03 Mph



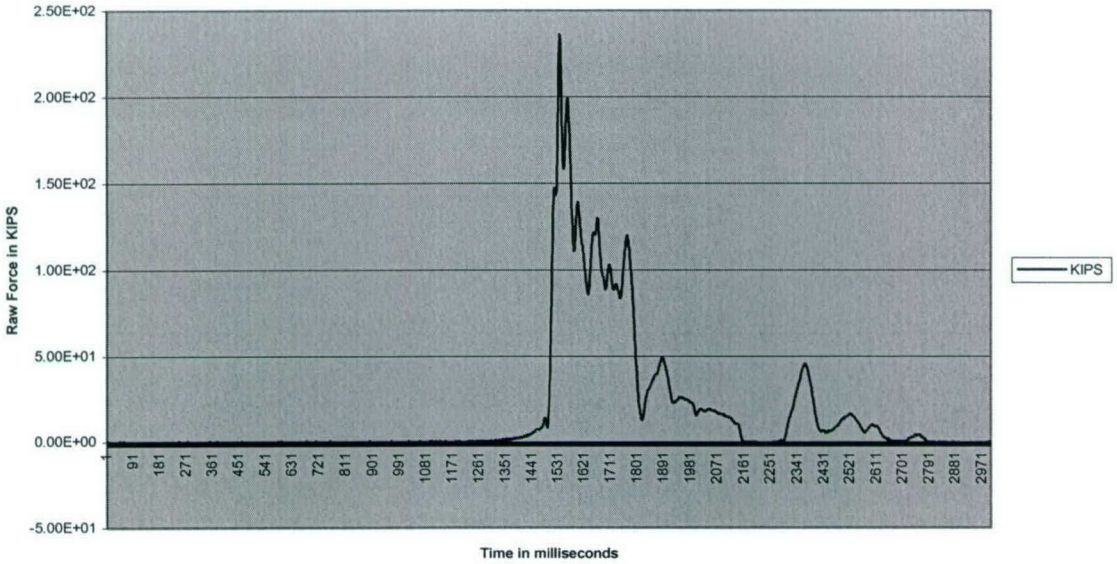
Coupler 7.95 Mph



Coupler 8.05 Mph

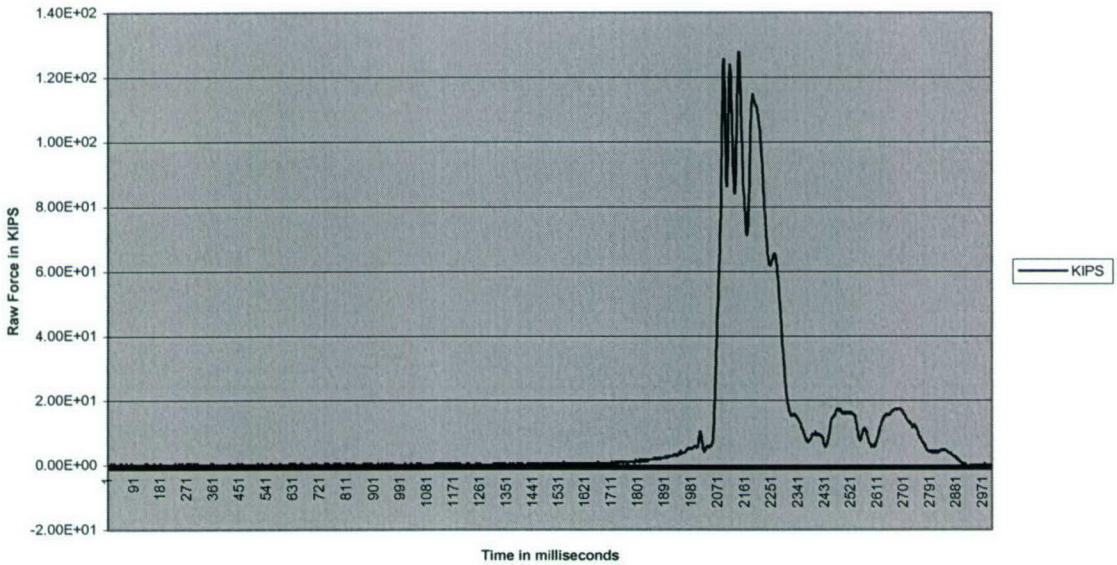


Coupler 8.92 Mph

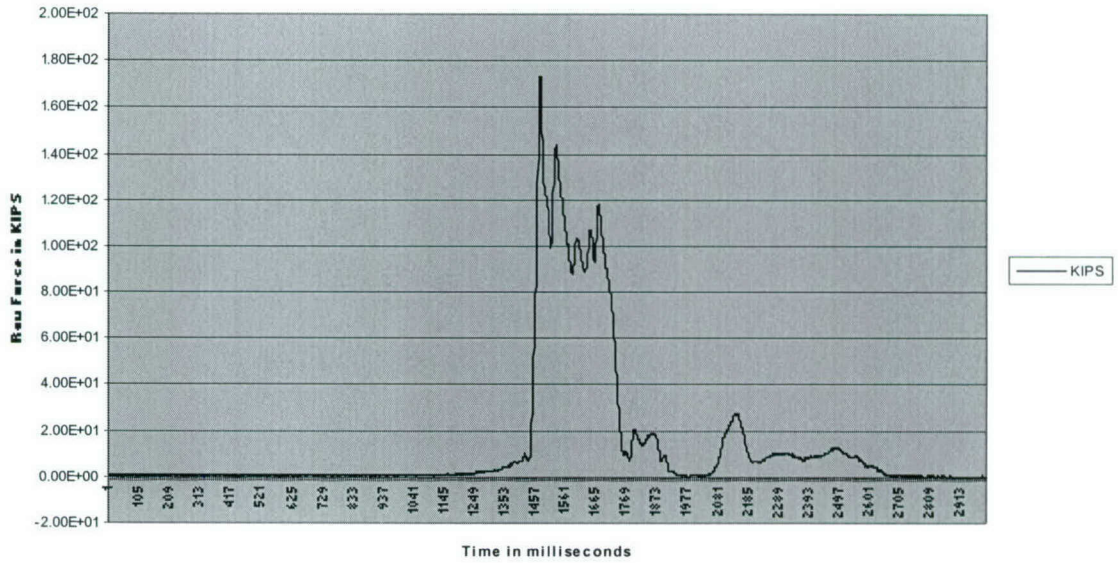


A. FMTV 5-TON TRUCK:
Date: 19-20 January 2005

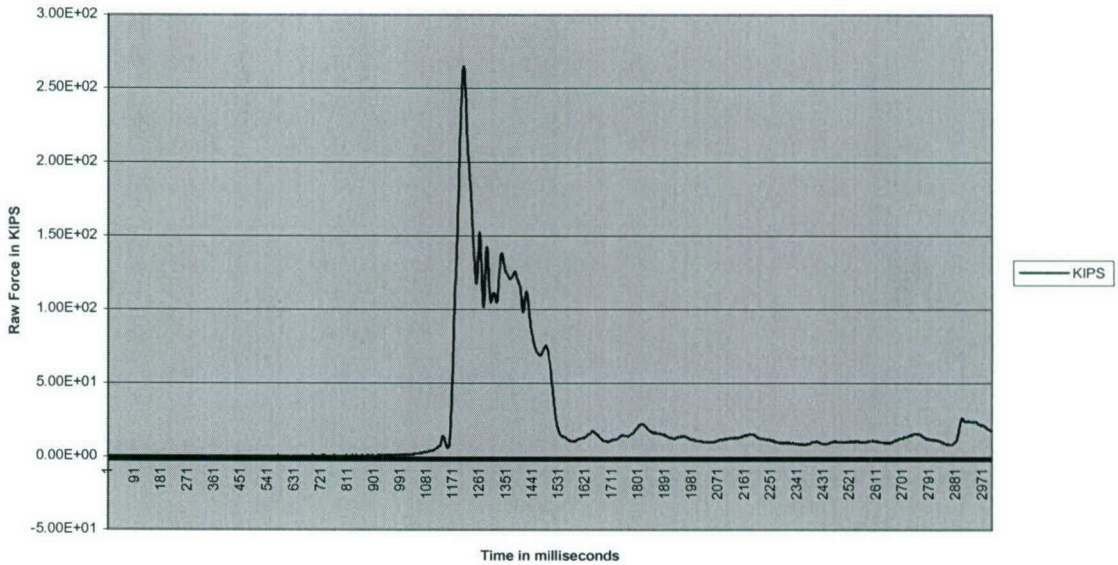
Coupler 4.12 Mph



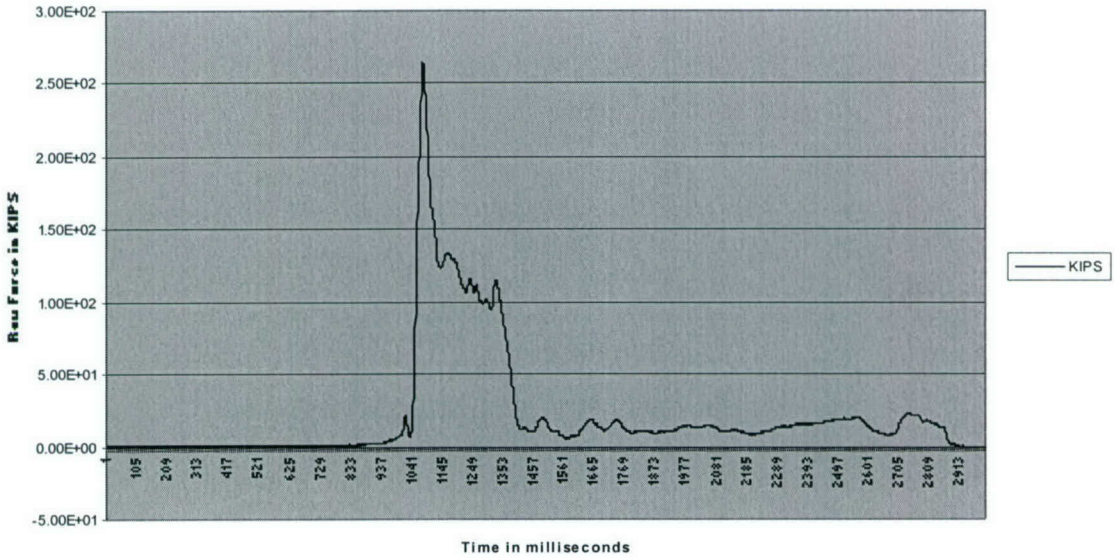
Coupler 6.13 Mph



Coupler 8.48 Mph

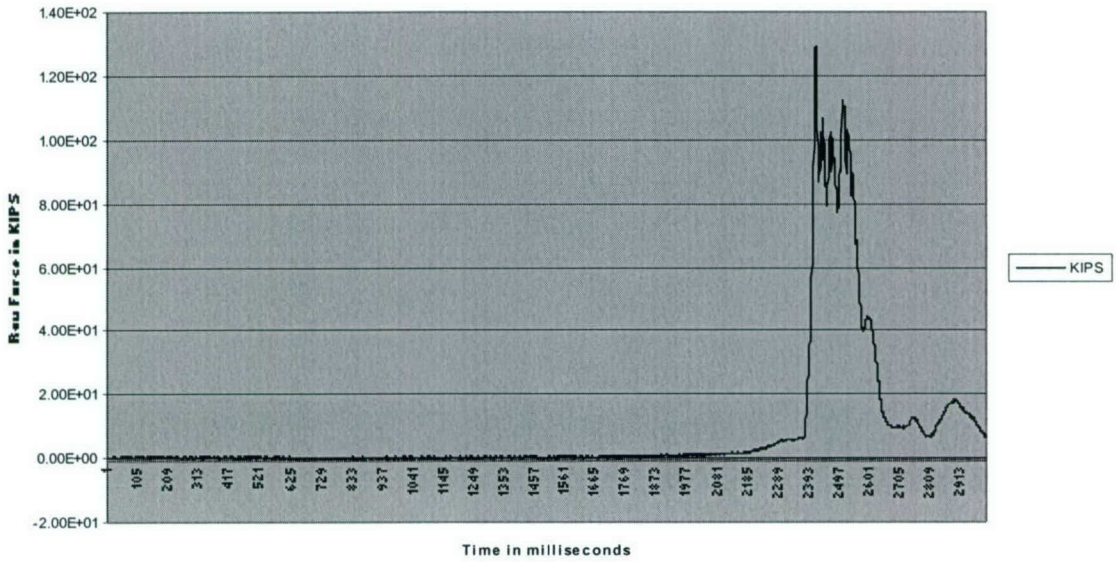


Coupler 8.67 Mph Reverse

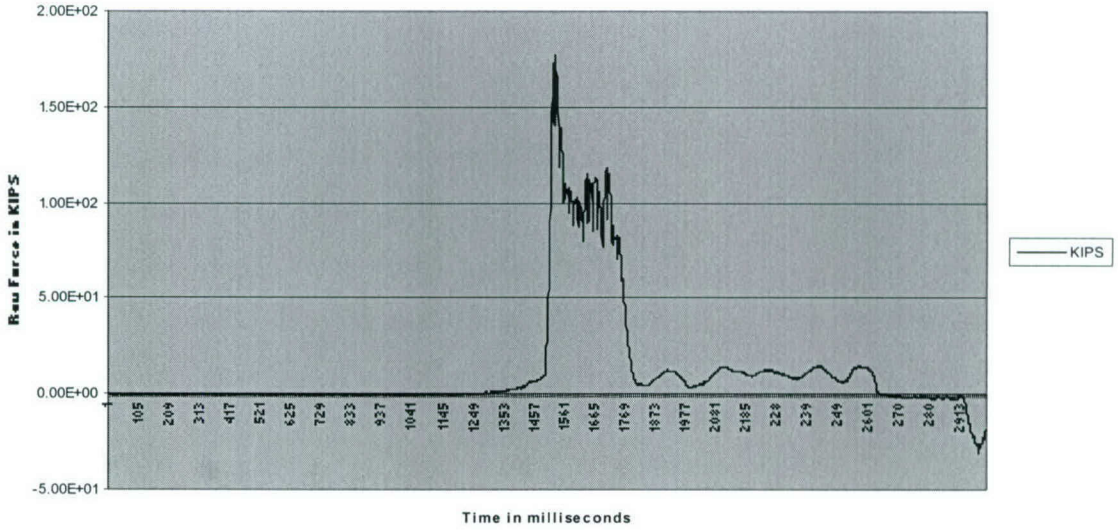


B. FMTV 2.5-TON TRUCK #2:
Date: 24 January 2005

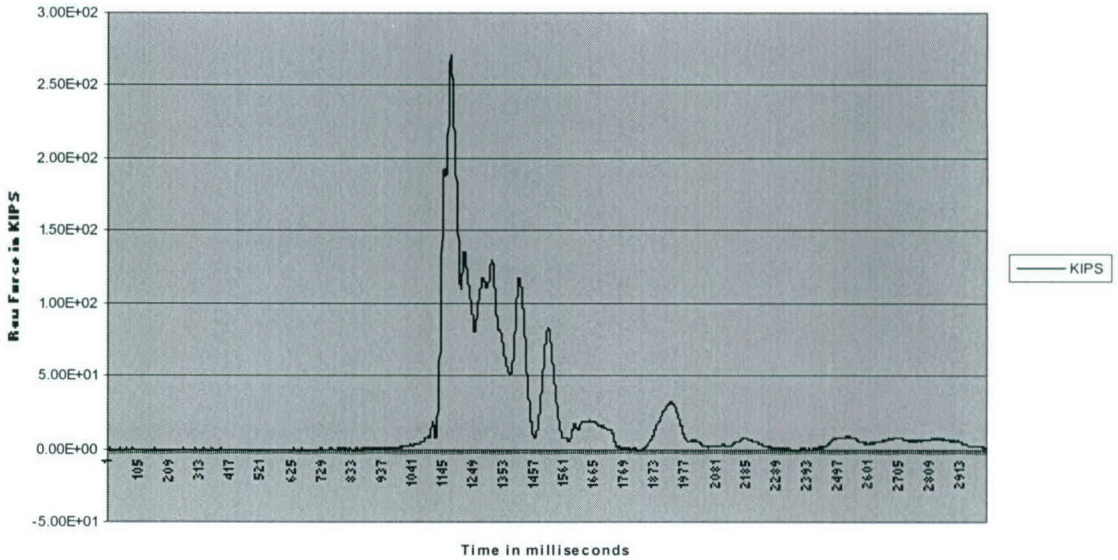
Coupler 3.86 Mph



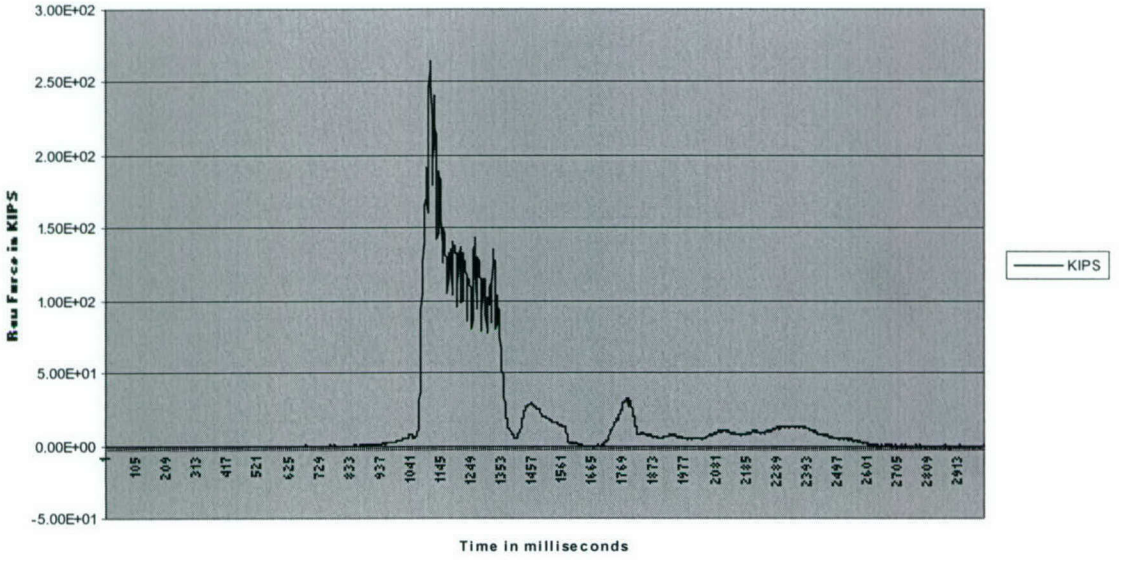
Coupler 6.35 Mph



Coupler 8.67 Mph

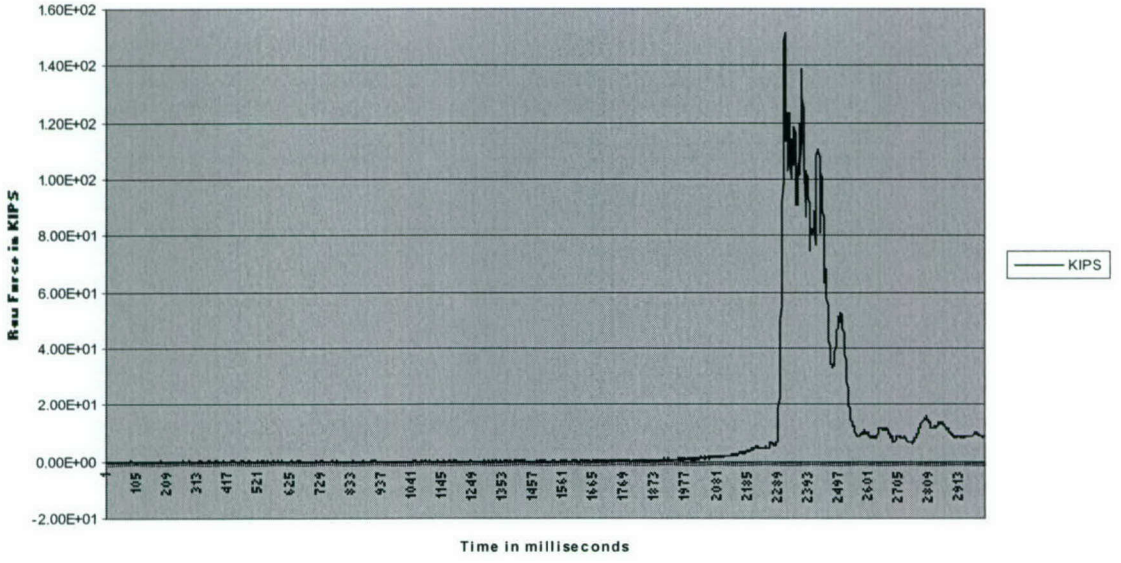


Coupler 8.64 Reverse

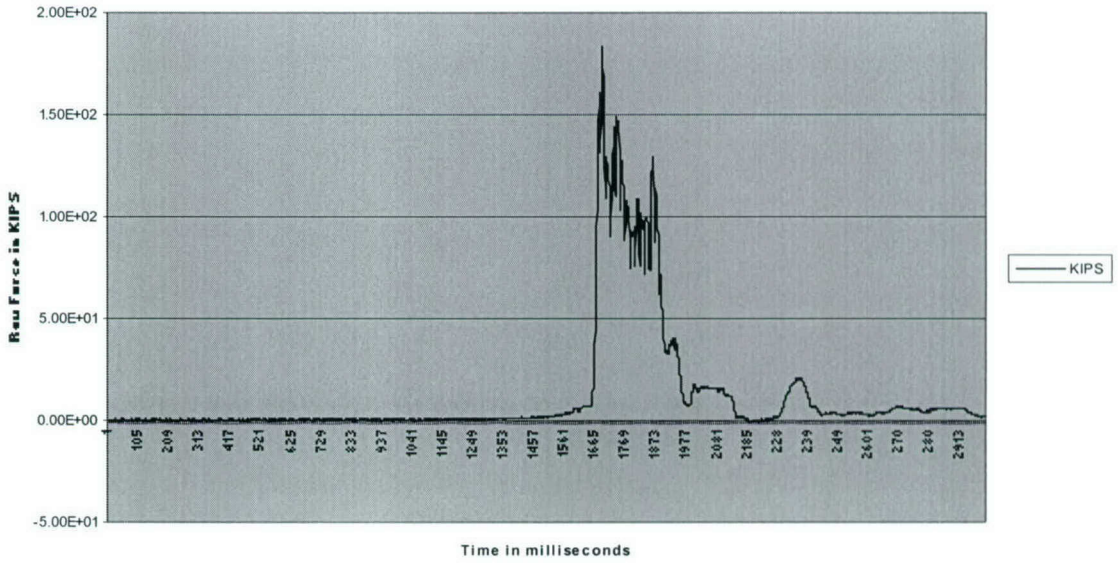


C. FMTV 2.5-TON TRUCK #3:
Date: 25 January 2005

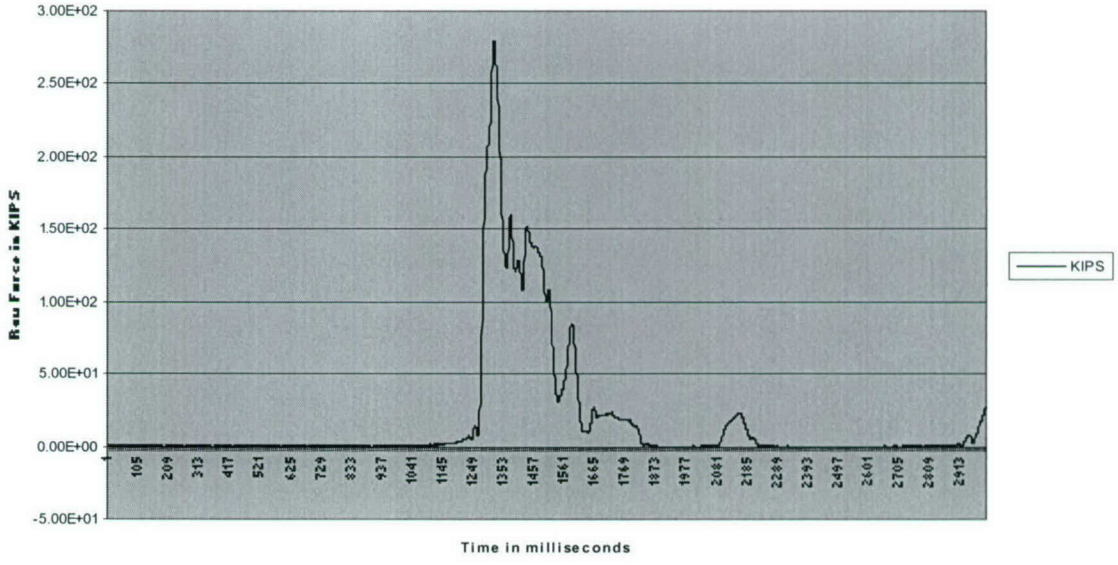
Coupler 4.28 Mph



Coupler 6.21 Mph



Coupler 9.11 Mph



Coupler 8.75 Mph Reverse